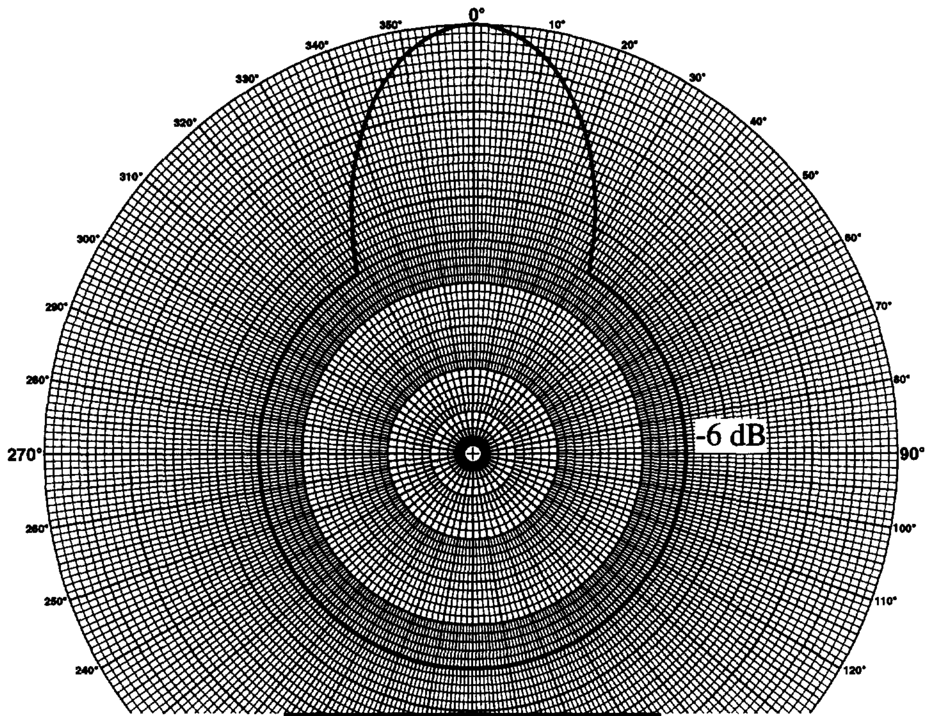
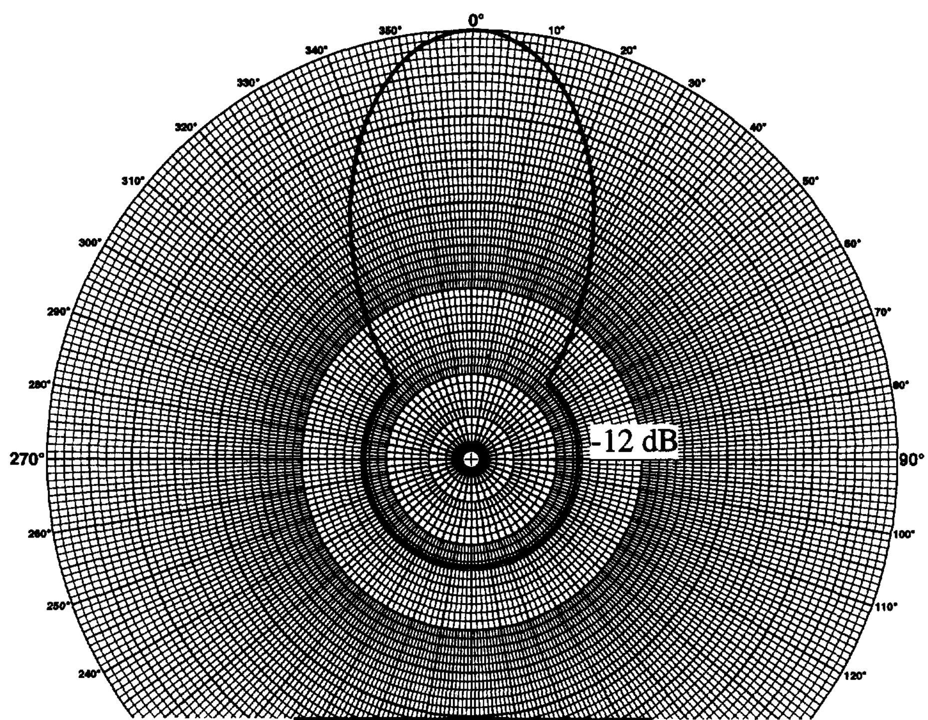
Granite Broadcasting Corporation • New York, New York

Different Consumer Receive Antenna Patterns, as Assumed by FCC "Replication" Program to Develop DTV Allotments - High-Band VHF -



NTSC Receive Antenna



DTV Receive Antenna

HAMMETT & EDISON, INC.
CONSULTING ENGINEERS
SAN FRANCISCO

970614
Figure 3B

DTV.IXSTUDY™ Analysis Methodology

Implementation of FCC's Interference-Based Allocation Algorithm

On April 21, 1997, the Federal Communications Commission released its Sixth Report and Order to Mass Media Docket No. 87-268, establishing a final Table of Allotments for the transition from analog NTSC television service to a digital television ("DTV") service. The Commission utilized a complex set of computerized analysis tools to generate the DTV allotment table and added FCC Rules Section 73.623(b)(2), requiring that similar tools be employed to analyze individual DTV station assignments with regard to their potential interference to other DTV stations, DTV allotments, and existing or authorized NTSC facilities. Hammett & Edison has developed computer software to perform this function, based on an examination of the FCC software source code.

For any given NTSC or DTV station to be studied, the FCC analysis model first determines the location of the conventional F(50,50) Grade B contour of the NTSC station, or of the NTSC station associated with an assigned DTV station, using pattern information contained in the FCC engineering database and an assumed antenna elevation pattern. The model assumes that contour as an envelope, outside of which no protection from interference is implied or afforded. The location of the Grade B contour is also used to determine the assigned power for the DTV station, once again using conventional methods found in FCC Rules Section 73.699, Figures 9 and 10, but determining the power necessary on a radial basis to generate the associated DTV coverage contour (41 dBu for UHF, 36 dBu for high VHF Channels 7–13, and 28 dBu for low VHF Channels 2–6), for the assigned DTV channel. The maximum power determined using this method was assigned as the DTV operating power, provided it was calculated to be above established minimum power levels; otherwise, a minimum power level was assigned. Note that the use of this method usually creates a directional antenna pattern, even for DTV assignments to presently omnidirectional NTSC TV stations. The FCC requires that a DTV facility employ an antenna design that meets the calculated pattern, or that a nondirectional antenna be employed that does not exceed the directional pattern envelope in any direction, unless the creation of no new interference can be demonstrated.

In addition to the use of the Grade B envelope and an assumed directional transmitting antenna for all DTV facilities, the model assumes the use of directional receiving antennas at each studied location, or "cell." The characteristics of the receiving antennas are different not only for the low VHF, high VHF, and UHF frequency bands, but also for NTSC and DTV receiving situations, where, based on the FCC model, more directive antennas are employed for analysis of DTV reception.

The FCC analysis technique employs terrain-sensitive calculation methods based on Version 1.2.2 of the ITS Irregular Terrain Model, also known as the Longley-Rice model. For each NTSC or DTV station to be studied, a grid of cells, two kilometers on a side, fills the associated Grade B contour. The program first determines which of the cells is predicted to receive service from the associated station, using Longley-Rice with F(50,50) statistical weighting for NTSC stations and F(50,90) statistical weighting for DTV stations. Cells determined to have no service are not studied for interference from other stations.* Once cells having service are determined, the software analyzes potential interference from other NTSC or DTV stations, again using the Longley-Rice propagation algorithm and F(50,10) statistical weighting for all potential interfering signals. Each cell is evaluated using the desired-to-undesired ratios presented in FCC Rules Section 73.623 for each channel relationship, and cells determined to have interference are flagged and summed with the study results of other cells, resulting in the generation of total interference area figures and tabulations of total population contained within the summed cells.

The Hammett & Edison analysis software program employs all of the analysis features described above, as well as several other more subtle elements employed in the FCC allotment program. Additionally, the Hammett & Edison program provides a graphical element that allows the identification of all interference cells on a map with an associated tabulation, and the program generates a DTV antenna pattern envelope that shows areas that can be maximized without creating interference in any cells that were not already receiving interference. The program can be used to test implementation scenarios that involve changes to antenna height, antenna pattern, channel number, and transmitter location. Additionally, the program has the capability to determine coverage areas of DTV and NTSC stations, with interference cells omitted. The Hammett & Edison program can also identify cells that fall in major bodies of water, based on digitized map data, summarizing those cells separately in an interference study or excluding them from a coverage study. Arguably, cells in water do not require protection from interference.

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* It is noted that the Longley-Rice model is not always capable of determining, within certain confidence limits, whether a particular block has service. In such cases, the Longley-Rice algorithm returns an error code; the FCC method for handling such error codes is to assume the associated cells have interference-free service, and as such, are not considered further. This assumption is presently being scrutinized by Hammett & Edison to determine its validity and to identify possible situations where significant actual interference areas may be overlooked from station studies.